CIVILIAN RESEARCH PROJECT

Evaluating Potential Alternatives to Total Dependence On Microsoft for Desktop Operating Systems and Applications

by

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The views expressed in this academic research paper are those of the author and do not necessarily reflect the official policy or position of the U.S. Government, the Department of Defense, or any of its agencies.

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ABSTRACT

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Last year, Microsoft introduced Enterprise Agreement 6.0, which locks organizations into making significant annual payments to Microsoft in exchange for access to all software updates and new versions of covered products during the three - year period of the agreement. This program, if implemented, puts a significant burden on the IT community who will need to absorb these costs within their existing budgets. This paper examines Microsoft, how they have achieved lock-in for their line of products, and some potential alternative strategies that could provide budgetary savings. The potential solutions evaluated are:

1. Is the Linux operating system ready for desktop deployment in a garrison environment? What Linux software exists, and how does it relate to the office productivity software that is currently utilized?

2. Currently we expend a significant portion of our IT budgets on updating desktop computers, could implementation of a thin client solution extend the life of existing hardware and provide a viable desktop solution for the average user?

3. Is StarOffice a viable alternative to Microsoft Office, what are the potential compatibility issues, and are there enough potential cost savings to justify further exploration and testing?

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INTRODUCTION

Networks across the Department of Defense (DoD) rely on Microsoft products in order to securely work and interact with and on our networks. The specific products that I am referring to are Microsoft Windows NT/2000/XP, Exchange, Server, Office, and soon ".Net." Currently, the majority of the Army's networks run on the Windows NT operating system, which will no longer be supported as of December 2003. To put the problem in proper perspective, in August 2002, the Army's Advanced Technology Integration Group estimated that 95% of the Army's automation was running the Windows NT operating system.[1] In today's virus and hacker filled environment, no organization can rationally justify the risk of running a non-supported operating system (no technical support or future security patches available). The fact that Microsoft has published 43 updates and security patches in support of Windows NT since 1999 attests to the current and future requirement for this support.

Under Windows NT, organizations expected to receive patches and updates to the system free of charge and incurred a relatively small charge for Microsoft advanced technical support. Organizations incurred minimal costs after paying for the product until it was replaced, and then they were generally able to purchase upgrades at a substantially lower cost.   Microsoft changed this concept when it released Microsoft Enterprise Agreement 6.0 (also referred to as the Microsoft Software Assurance Program).   Enterprise Agreement 6.0 is Microsoft's attempt to stabilize its cash flows by having its customers pay an annual fee per computer for a three-year period. This

agreement entitles the purchasers to all updates of that product during that period. Those organizations that do not sign up for licensing 6.0 will be required to purchase the full product when they update, as opposed to purchasing an upgrade at a reduced cost, as had been the previous practice (e.g., purchase a full version of Windows XP when upgrading a Windows 2000 machine). Although Microsoft claims that organizations will realize significant savings, projections are that organizations choosing to sign up for Enterprise Agreement 6.0 will end up paying anywhere from 33% to 107% more than they would have previously.[2] Variances in the projections involve assumptions based on whether an organization would purchase every upgrade available or would normally skip a generation (e.g., go from Window NT 4.0 to Windows XP without ever implementing Windows 2000). Often, the government is slow to implement new technology due to the scope of the change, the costs involved, and concerns about being on the "bleeding edge" of technology where unforeseen problems wreak havoc on early implementers. The Army is still trying to determine how to effectively implement "active directory", which became part of the Microsoft network infrastructure with the release of Windows 2000 almost three years ago. There is tactical brilliance in Microsoft's implementation of Enterprise Agreement 6.0 because organizations once enrolled are locked into Microsoft products for the next three years and are effectively blocked from implementing alternatives such as Linux.

With the limited annual Information Technology (IT) budgets that Army organizations have available to them, most expenditures are for maintaining and updating hardware and keeping up with growing requirements for new systems. Army regulation (AR) 25-1 states, "In planning life cycle requirements and calculating

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economic benefits of automation IT, five years from the initial date of installation will be used as the metric for obsolescence."[3] This and the massive growth in automation capabilities have forced organizations to try and update 20-25% of their automation equipment annually.   The impact of this can be seen when you consider that for FY 2002 and several years previously the Army was Dell Computer's number two customer (second only to the Navy).[4]

MICROSOFT

LOCK-IN

Before considering alternatives to Microsoft, it is necessary to examine the hold that they have on the market and how they have achieved lock-in. Lock-in is based on the significant costs that an organization would incur if it tried to switch to a different or competing product. Lock-in, by itself, is neither a positive or negative situation; it must be considered in relation to its impact on achieving the organization's overall goals and objectives. Lock-in does however limit the ability of an organization to rapidly and inexpensively switch to alternative products/solutions once implemented. Switching costs for Microsoft products fall into the following primary categories: the trained user base, compatibility with the existing documents/files, and the ability to interact with players outside of the organization.

Organizations spend very little on training personnel to operate in a Windows environment or utilize Microsoft Office products. The reason is that Microsoft has such advanced (some would say monopolistic) penetration of the market that users are trained through the school system and by utilizing the same or similar versions of the product on their home systems. In 1999, Microsoft Windows held an 87% desktop

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market share according to IDC analyst Dan Kusnetzky.[5] There is a tremendous value in having this product familiarity and a large trained operator base that minimizes training costs (both in terms of dollars and time spent away from the office) to the organization. Users who are knowledgeable with some Microsoft products will often find that other Microsoft products are written with similar features and commands, thus expediting the learning curve when working with new or updated programs.

With an 87% installed base, it is obvious that software developers will ensure that their products are designed to work on the Microsoft operating systems to maximize the potential market for their products.   The majority of most organizations' historical documents are saved in Microsoft formats. Organizations would have significant problems converting to a different format or suite of programs that would either not read the documents or have significant formatting translation problems (e.g., macro's not converting or problems with fonts, attributes, etc.).

Finally, the DoD does significant business both interagency and with the outside world through vendors, contracted personnel, and non-governmental organizations and must have the ability to quickly and easily swap documents in the course of routine business. Virtually every organization uses Microsoft products for their desktop office productivity suite (i.e., Microsoft Office/Works).

PLANNED OBSOLESCENCE

Microsoft compounds the problem of lock-in with the planned obsolescence of their products. On 15 October 2002, Microsoft released its Support Lifecycle Policy that states that Microsoft will provide mainstream support for five years after the release of a product and that extended support can be procured (at an additional cost)

for an additional two years. Distributable "hot fixes" that patch security holes or

vulnerabilities and that are requested during the extended support phase will be priced

at a cost of $60,000 each.[6] It should be noted that security patches will be made

available through the end of the Extended Support phase (seven years total) at no

additional cost for most products.[7] The table below lists the Microsoft support timeline

for the major products currently in use within the Army:

Product Name	Availability Date	Mainstream Support Retired	Extended Support Retired
Exchange Server 5.5	3 Feb 1998	31 Dec 2003	31 Dec 2005
Exchange Server 2000	29 Nov 2000	31 Dec 2005	31 Dec 2007
Office 97	16 Jan 1997	31 Aug 2001	28 Feb 2002
Office 2000 Professional	27 Jun 1999	30 Jun 2004	30 Jun 2006
Office XP Professional	31 May 2001	30 Jun 2006	30 June 2008
Outlook 98	21 Jun 1998	31 Aug 2001	28 Feb 2002
Outlook 2000	27 Jun 1999	30 Jun 2004	30 June 2006
Outlook 2002	31 May 2001	30 Jun 2006	30 June 2008
Window NT 4.0 Workstation	29 Jul 1996	30 Jun 2003	30 Jun 2003
Windows NT 4.0 Server	29 Jul 1996	31 Dec 2002	31 Dec 2003*
Windows 2000 Professional	31 Mar 2000	31 Mar 2005	31 Mar 2007
Windows 2000 Server	14 Mar 2000	31 Mar 2005	31 Mar 2007
Window XP Professional	25 Oct 2001	31 Dec 2006	31 Dec 2008

* extended support fees waived

TABLE 1	MICROSOFT PRODUCT SUPPORT TIMELINE

In addition to planned obsolescence, Microsoft has historically induced users to

upgrade by failing to update older products to reflect technological gains. For example,

Microsoft never released drivers to allow Windows NT 4.0 the ability to utilize the

Universal Serial Bus (USB). USB was a significant increase in technological capabilities

and system ease of use that was released in 1996 and had been installed in

approximately one billion devices by the end of 2001.[8]   A more recent example would

be Microsoft's announcement that its soon to be released Microsoft Server 2003 will not support Exchange 2000.[9]

LICENSING

Microsoft has historically used licensing to its advantage. When a new system is purchased, it traditionally will have a Microsoft operating system and either Microsoft Office or Works. These products are provided on an OEM (Original Equipment Manufacturer) license, which means that the software may be legally used only on that specific machine. If the machine is taken out of service for some reason, the software may not be reused on any other machine. Credit should be given to the Reserve Component Automation System (RCAS) contract, which eliminated this provision for those systems on the original procurement and thus allowing software residing on machines taken out of service to be reutilized.

SECURITY/INFORMATION ASSURANCE

A major concern of network managers is the susceptibility of Microsoft products to viruses and the large number of security vulnerabilities that are detected within Microsoft products. While there is no doubt that there have been numerous flaws in Microsoft products, it must be considered that the reason programmers of worms and viruses target Microsoft products is due to their large installed base. Operating systems with a smaller market share are not as inviting of targets due to the significantly smaller potential base of systems to be affected. The costs of security vulnerabilities and viruses must be evaluated in relation to the cost of implementing fixes, patches, and lost

productivity. When evaluated in these terms, the impact of viruses, worms, and security flaws is enormous. Computer Economics estimates that the "Love Bug" virus released in FY 2000 generated economic and productivity damages costing in excess of $8.7 billion.[10] In FY 2002, Microsoft, who had been plagued with numerous security flaws and concerns, shut down its Windows division to review every line of code of Windows XP and ".Net" from a security viewpoint.[11] This new in-depth security focus is expected to continue for all future Microsoft products. In January 2003, the SQL(Structured Query Language) slammer worm, which exploited a flaw in Microsoft's SQL Server database software, spread worldwide, wreaking havoc on the internet, finance, and industry, even though the patch to correct the flaw had been released six months previously.[12] This highlights the criticality and difficulty of maintaining a secure network.

INTEROPERABILITY

A significant advantage of using the Microsoft family of products is interoperability. There are several facets of interoperability that come into play. Microsoft products are designed to work together. The user has a high degree of confidence that a current Microsoft product will work and work well on the Microsoft operating systems and have limited issues working with other Microsoft products. Further, Microsoft products are interrelated in that often a user can take an input from one Microsoft product and copy or paste it into another Microsoft product (e.g., copying an Excel spreadsheet into a Word document). Thus, the user gains time and efficiency by being able to utilize input from one product in many others without having to re-input the data. Keystrokes, processes, and icons are often consistent across the Microsoft

product line, thus expediting the learning curve for employees learning to use a new program. Finally, while all versions of a Microsoft product are not necessarily backward compatible, previous documents or files can normally be imported into a newer version of a program although the document or file may be permanently altered in the process (e.g., an Office 97 Access database file may be read by Access 2000, but in doing so, the file will no longer be usable for earlier versions of Access).

The strengths and advantages of utilizing Microsoft products have been reviewed, but the potential alternatives or strategies that could provide potential cost savings have not yet been discussed. The reader will note that an evaluation of the Apple product line has not been included in this paper due to their low market penetration, limited software availability, and the requirement to replace all hardware and software if chosen. Alternatives that will be evaluated as possible solutions are the Linux operating system, the implementation of thin client, and the potential use of StarOffice.

LINUX OPERATING SYSTEM

HISTORY

The problems generated by Microsoft's implementation of Enterprise Agreement 6.0 have generated a significant interest in a Microsoft alternative.   In April of 2002, a survey conducted of 1400 businesses found that 38% were seeking alternatives to Microsoft products.[13] This impetus for alternatives and change has provided new life to the Linux operating system.

The Linux operating system is an open source operating system developed by Linus Torvalds at the University of Helsinki in Finland in 1991. Torvald's original intent was to write a new version of Unix (an operating system for mainframe computers) that would be widely available, distributed freely, and able to run on a personal computer (originally designed for the Intel 386 but now is supported on multiple platforms).

ADVANTAGES

Proponents for Linux rely on multiple aspects of the operating system to justify its implementation. These aspects revolve around Linux's reliability, open source framework, increased security, lower total cost of ownership, and reduced dependence on a single provider.

Open Source

Open source means that the source code is freely available and is modified or updated by a community of users. Supporters of this concept point out that community-developed code is often far better written than code from a single organization due to the wide variety of skills and experience that volunteer software authors and beta testers bring to the continual development of this product. When there is a requirement to develop a new driver or write a security patch, this can be done easily because the source code is open. In addition, once developed, these items are shared freely by the tight-knit Linux community. This sharing applies to many Linux applications as well as the operating system. Open source limits an organization's risk should a firm providing the Linux operating system go out of business; users can still maintain the software because they have the source code. When conventional closed-sourced software

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providers go out of business, no further developments can be made. Open source software is not necessarily free, but the source code is available, and users are able to write and implement modifications to the code.

More than two-dozen countries in Asia, Europe, and Latin America, including China and Germany, are now encouraging their government agencies to use open source software.[14] The desire to ensure competition and to minimize software costs appears to be the impetus for this action. The governmental concerns are probably best summed up by Germany' Interior Minister, Otto Schilly, who said, "We are raising computer security by avoiding a monoculture, and we are lowering dependence on a single supplier."[15] In an attempt to counteract the momentum of this growing movement, Microsoft has founded the "Initiative for Software Choice." This organization advocates that government and corporate customers procure software on its merits, not through categorical preferences. Public entities should procure the software that best meets their needs and should avoid any categorical preferences for open source software, commercial software, free software, or other software development models.[16]

The Mitre Corporation recently released a study concerning the use of free and open source software (FOSS) within the Department of Defense (DOD). During a two week survey, they found 115 FOSS programs in use within DoD for 251 different purposes but acknowledged that actual use may be significantly larger, possible even tens of thousands of times larger than the number of examples identified in the survey.
[17] The report states:

> "The main conclusion of the analysis was that FOSS software plays a more critical role in the DoD than has generally been recognized. FOSS

applications are most important in four broad areas: Infrastructure Support, Software Development, Security, and Research.   One unexpected result was the degree to which Security depends on FOSS. Banning FOSS would remove certain types of infrastructure components that currently help support network security.   It would also limit DoD access to – and overall expertise in – the use of powerful FOSS analysis and detection applications that hostile groups could use to help stage cyber attacks.   Finally it would remove the demonstrated ability of FOSS applications to be updated in response to new types of cyber attack."[18]

The report further recommended:

"Encourage use of FOSS to promote product diversity. FOSS applications tend to be much lower in cost than their proprietary equivalents, yet they often provide high levels of functionality with good user acceptance."[19]

Reliability

Linux's reliability has long been one of its selling points. Software patches may be applied to a Linux system while the system is running without requiring a system reboot as is typical of Microsoft patches. The only time a Linux system would typically need to be rebooted is when the user needs to change the kernel. Bloor Research conducted a study comparing the stability of Linux and Windows NT over a one-year period. They found that the Linux system failed one time, taking 4 hours to repair. The Windows NT system crashed 68 times for a total downtime of 65 hours.[20] That factor aside, Bloor Research concluded in their FY 2000 study that Linux was not yet ready to support large enterprise applications. However, a follow-up study published in January 2003 states:

"After examining Linux scalability, availability, reliability, security, manageability, flexibility, as well as server consolidation characteristics, Bloor Research believes that Linux is now enterprise ready."[21]

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Security/Information Assurance

The literature concerning the vulnerabilities of the Linux and Microsoft operating systems vacillates wildly. Often times, the research is funded by various manufacturers of competing software and should be viewed with skepticism. An analysis of the vulnerability alerts issued by an independent service for the period of Aril 2001–March 2002 found that 19 vulnerabilities were issued for the Linux operating system versus 36 issued for Microsoft operating systems.[22] Although it could be argued that the numerous Microsoft Operating systems make this an unfair comparison, it must be balanced by the fact that there are multiple vendors and versions of the Linux operating system. Using these criteria, the conclusion is that, to date, Linux has had fewer vulnerabilities than Microsoft operating systems and thus has been more secure.

Fragmentation

Much like Unix systems in the 1980s, users fear Linux could fall prey to having numerous different versions of the same operating system with no guarantee that any given program will work on a particular manufacturer's version of Linux. This is unlikely to happen because the industry is aware of the problems of fragmentation and realizes that it could destroy hopes for widespread adoption of Linux. Commercial Linux distributors adhere to a common file system hierarchy and use kernels and libraries from the same series.[23] Most adopters of Linux want reliability and responsive technical support and have chosen to utilize a "branded" version of Linux sold by vendors such as Redhat, Lycoris, and SuSe rather than use the freely distributed but unsupported versions.

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Server Environment

While Linux has had only moderate success as a desktop operating system, it has had significant success in the server market. Figure 1 shows that Linux accounted for 27% of all server operating system shipments in 2000[24], and a study done by the Butler Group has predicted that Linux will become the major server operating system by 2009.[25]
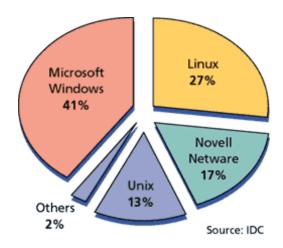

FIGURE 1. SERVER OS SHIPMENTS CY 2000[26]

Linux is also making successful inroads as a replacement for the Unix operating system. A recent study comparing and ranking Unix and Linux operating systems from multiple vendors found that the capabilities and performance of the Linux operating system improved significantly over the results of a similar study conducted two years previously. The results showed that four versions of Linux have become more capable operating systems than the lowest-ranked version of Unix.[27] In October 2001, Amazon.com reported a 25% ($17 million) reduction in quarterly technology expenses

due primarily to "migration to a Linux-based technology platform using a less costly technology infrastructure, as well as a general price reductions for data and telecommunications services due to market overcapacity."[28] This and other anecdotal evidence has resulted in several major corporations (IBM, Sun, Dell, etc.) investing billions of dollars into Linux. In FY 2000 alone, IBM made a $1 billion investment to grow the Linux industry.[29]

Desktop Environment

Linux inroads into the desktop (client) operating system market have been extremely limited. Industry figures indicate that in 2001 Linux had only 1.7% of the total client operating system market in comparison to Microsoft's 94%.[30] Although this is a disheartening statistic, there is room to believe that the future will be more successful for a Linux desktop environment. International Data Corporation (IDC) predicts that Linux will become the number two desktop OS by the end of 2004 (surpassing the Apple's MAC OS).[31] Adaptation of the Linux operating system has been limited due to the difficulty in using Linux (which until recently did not have a graphic User Interface (GUI)) and the lack of basic applications that were compatible with the formats and files generated by the market leaders. This is now changing. Versions of the Linux operating system with familiar GUIs are now becoming available. Two versions of prominence are the Wine Project and Lindows. There are numerous Linux compatible products that provide similar but not necessarily the full functionality of Windows-based products. Nor do many of these programs utilize compatible fields or file formats. Table 2 provides a comparison of products with similar functionality.

Windows Based Product	Linux Compatible Counterpart
Microsoft® Office	StarOffice 6.0, OpenOffice
Microsoft® Word	StarOffice Writer, OpenOffice, Write Pro
Microsoft® Excel®	StarOffice Calc, OpenOffice, Spreadsheet Pro
Microsoft® PowerPoint®	StarOffice Impress, OpenOffice, Presenter Pro
Microsoft® Outlook®	Netscape Mail, Evolution
Microsoft® Internet Explorer®	Netscape Browser, Mozilla Browser
Adobe® Photoshop®	GIMP, Photogenics
Adobe® Illustrator®	Sketch, Illustrate
Microsoft® FrontPage®	HTML Editor, BlueFish
Microsoft® Visio®	Chart Pro, Flowchart Pro
AOL® Instant Messenger	Netscape AIM, AOL AIM, GAIM
Real Player	Real Player
CD Burning	K3B CD Burner
Time Management	Time Organizer, Pilot Sync
Adobe® Acrobat® Reader	Adobe® Acrobat® Reader

TABLE 2. SIMILAR FUNCTIONALITY OF WINDOWS/LINUX PRODUCTS[32]

THE WINE PROJECT

The Wine Project was started in 1993 to develop a compatibility layer that would allow users to run Windows programs on Linux without requiring a license for the Microsoft OS. As of the end of 2002, the Wine project consisted of over one million lines of code written by 300 developers in numerous countries. Wine is free to download, but because the product is currently under development, a new version is released monthly on average. This product is still immature and has extremely limited Windows compatibility and thus is not likely to be widely adapted for some time.

LINDOWS

Lindows is a commercially available Linux-based operating system that incorporates a full GUI and some of the features from the Wine Project. Compatibility with Windows software is extremely limited, and purchase for this purpose is not

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recommended. [33] Lindows provides for easy installation (a common complaint of Linux users), technical support, and access to numerous programs that are compatible with existing Microsoft file formats (e.g., .doc, .ppt, .xls, etc.). The Lindows end user license (EULA) allows it be installed on any computer used by the end user and immediate family members living in the home. The cost for this program is $49, and if bundled with access to the Click & Run software library and technical support for a year the cost increases to $129. Microsoft is taking the company to court alleging that the Lindows.com name has infringed the Windows trademark.[34]

In September 2002, Lindows partnered with Microtel to make and distribute low-end ($199 to $299) Linux based personal computers (PCs). These PCs were selling at such a high rate that in December Walmart suspended sales for four weeks for Microtel to catch up on its backlog production.[35] This rapid expansion of the Lindows user base may well attract further interest and development of Linux and Lindows. It is apparent that this product, though promising, is not yet suitable for use in a business environment.

CROSSOVER OFFICE

Crossover Office is a product developed and sold by CodeWeavers that takes a different approach by allowing Microsoft Office 97 and Office 2000 (with the exception of Access), Visio, and Internet Explorer to run on a Linux-based system. The product costs $64.95 per machine and generates savings by eliminating the requirement to purchase the Microsoft OS.   Because it runs on the Linux OS, it will run on older machines (minimum of 200 mhz) that could not support Office 2000 in a Windows 2000 or XP environment. This product is relatively new, but the reviews have been

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overwhelmingly supportive. It should be noted that Codeweavers has developed a server version of the program for operation in thin client environments.

Clearly the current state of Linux is not yet mature enough for implementation on a wide scale without significant sacrifices in the areas of ease of use and compatibly with existing or historical files and documents. Organizations implementing Linux would need to invest heavily in employee education and should expect reduced productivity during the transition.   In addition to the concerns involved with the implementation of new programs to replace the current office productivity suite, the Army has invested significant time and money developing numerous agency specific Windows-based applications (such as TROUPERS, SATS, PBAS, etc.) that would have to be tested and potentially rewritten before the current version of Linux could be implemented. Increased compatibility with Windows applications is the lynchpin for adaptation of the Linux OS. A survey of 15,000 companies published in August 2002 found that 58% of the respondents would switch to Linux immediately if it was capable of running Windows applications, and an additional 25% would give it serious consideration.[36] The marketplace would benefit from competition, if the Linux operating system were to emerge as a true competitor to Microsoft desktop operating system.

THIN CLIENT

Why is a discussion of thin client solutions incorporated into a paper examining the impact of the planned obsolescence of Microsoft software?   Automation budgets are relatively fixed, so if there is now a requirement to make a significant annual payment for Microsoft software under the DOD Enterprise Software Initiative (ESI), then

the funds expended for hardware upgrades will be significantly reduced. Thin client

implementation may allow organizations to extend the useful life of their automation

hardware and reverse the historical spending pattern, where funds are spent to refresh

20-25% of our hardware annually. Additionally, every four to five years significant sums

are spent to upgrade software (both the operating system and productivity software).

WHAT IS THIN CLIENT?

To better understand thin client and its ramifications, it is necessary to first

consider the various types of computing clients available. The three main types are

defined below: [37]

- Fat Client – PCs used in a traditional manner with applications running on the

  PC and data stored either on the PC or servers,

- Thin Client – Thin client devices (also referred to as network devices or

  appliances) that use servers to run applications and store data. Typically, thin

  clients use only keyboard, video, and mouse (KVM) with no internal or

  removable storage capabilities.

- Tubby Client – PCs that have an operating system and the ability to run

  applications but also use a locally installed client to connect to the thin client

  computing environment for all or some of their applications. Tubby client is a

  fat client machine running some thin client applications. This gives the user

  the best of both worlds.

Thin client simply moves the computing power from the workstation to the server.

The easiest way to understand it is to think of the "dumb" terminals that were prevalent

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when the majority of computing was accomplished using mainframe computer systems. When the mainframe was down, the "dumb" terminal was not operable.

ADVANTAGES

The primary advantages to a thin client solution are reduction in support costs, increased security and information assurance, reduced hardware and software costs, ease of software accountability, and lowered energy and bandwidth consumption.

Support Costs

The majority of organizations that implement a thin client solution find that their IT departments are able to provide better customer service with fewer personnel. Estimates have ranged as high as an 80% savings in IT support staff costs[38] The majority of these savings are realized through ease of software deployment (on the server versus installation on every PC) and significant reduction in end user issues. The mean time between failures for a thin client device is 175,000 hours as opposed to 30,000 hours for a personal computer.[39] Users have the ability to access both their work and data from virtually any machine, and no data is lost in the event that a thin client device fails.

Information Assurance

Information assurance and security in a thin client environment are greatly enhanced because the user has no ability to install software or applications or upload anything into the system. Pure thin client environments also limit the threat of virus introduction to the network via incoming e-mail using a single control location. Security

patches can be quickly implemented, and there are no issues regarding problematic access to remote machines. The theft of a thin client device does not compromise the system's security or generate the loss of any data, thus eliminating the potential for problems like the recent compromise of the personal data for 550,000 Tricare beneficiaries that was contained on the hard drives of computers stolen from the Triwest office in Phoenix, AZ.[40] Indeed, there is little motivation to steal a thin client device because it has no functionality unless connected to a network.

Many users desire access to their network and files from home systems or their laptops when they are traveling. In fact, the federal government had established a goal of having 15% (160,000 employees) of the federal workforce telecommuting by 2002[41] in reality, the United States Office of Personnel Management (OPM) found that in January 2002, only 4.2% of the federal workforce (~44,800 employees) was participating in telecommuting programs.[42] The increased availability of broadband and DSL Internet access has made telecommuting from home a reality, and 95% of all federal employees that telecommute work out of the home[43].

Thin client allows the users to telecommute while minimizing the threat to the network. Network administrators often have no idea what is loaded on users home systems, or laptops or whether appropriate virus protection software is installed and maintained on these systems. Using thin client to gain access to the network ensures that the user cannot transfer viruses and threaten the security of the network no matter what computer they use to access the system.

Hardware/Software Costs

Thin Client devices are significantly cheaper than desktop personal computers with a number of devices costing approximately $500 or less. In addition, older PCs can easily be converted to a thin client device for minimal cost and extending their life far past the point that they were no longer suitable for desktop PC operations. Another significant factor is that the power consumption of a thin client device is typically only 14% of that of a PC. [44]

Software licensing costs can be significantly reduced. Thin client allows the organization to purchase a number of licenses for concurrent use. Under this concept, an organization may have 1,000 systems but only purchase licensing for 500 concurrent users. Any user on any system may be authorized access to the program, but the 501st user at any given time will be denied access until another user terminates usage of the program. In this example, the organization will save the cost of the 500 software licenses through thin client scalability. Concurrent user licensing is not available for all products. Microsoft requires "per seat" licensing for its Office suite of programs, which means that the organization must purchase a license for every system that may use their product (in the example above,the organization would be required to purchase 1,000 licenses).

Software Accountability

Thin client also greatly simplifies software accountability because it is easy to determine at any point the number of copies of given software that the organization is using by querying the servers. Currently, there are significant problems in regard to

software accountability in military organizations, and the Army risks running into significant problems such as those recently experienced by the Portland school district. The district was ordered by Microsoft to submit proof of licensing for its 25,000 computers or face the consequences. The Portland school district determined at the time that it would cost $300,000 to complete the audit and meet Microsoft's demands for documentation.[45]

Energy Consumption

One interesting benefit of going to a thin client network is the significant savings in energy costs. A study conducted in 2001 comparing the costs of a 100 person network with all related equipment (e.g., PCs or thin clients, monitors, file servers, hubs and switches, modems, and terminal services) determined that a thin client network would save between $3,000 and $6,000 annually in energy costs..[46] Extrapolated across the force (approximately 300,000 machines), the savings would be significant.

Bandwidth Consumption

Bandwidth is becoming an increasingly scarce resource. As fast as bandwidth is increased, new applications are generated that consume the increased capacity. Examples of applications and usage that increase bandwidth consumption are web-based applications, distance learning, and video and audio teleconferencing. Most networks are now using server storage, which necessitates the downloading of a document, spreadsheet, or email attachment onto the user's PC every time it is accessed, thus increasing the load on available bandwidth. Thin client networks do not download the data or document; rather they allow users to work on the server thus

conserving bandwidth. While some manufacturers claim up to a 90% reduction in bandwidth requirements, in fairness a recent study found that these claims are excessive, and actual results may be as low as a 50% reduction.[47]

DISADVANTAGES

While there are numerous advantages to thin client computing, it is important to realize that there are some disadvantages and that thin client is not the solution for all networks or users. The primary disadvantages are increased dependence on network connectivity, problems with high-level processing, and difficulties in implementation due to end-user satisfaction.

Network Connectivity

The most obvious disadvantage for thin client solutions is the reliance on a network connection to be productive. Should the network go down, the end user has no automation capability. This normally translates into organizations maintaining an enhanced network infrastructure with backup hardware and a thorough recovery plan.

High-Level Processing

Thin client is unsuitable for users who work with applications that require intense graphics or high-level processing. Examples of these type of applications are Computer Assisted Drawing (CAD),Computer Assisted Manufacturing (CAM), and streaming video. Users who utilize these applications should use a tubby client solution that will allow them to execute applications in either a thin or fat client environment as needed.

End User Satisfaction

Many users enjoy customizing their desktop (wallpaper, sounds, audio, or installing applications to monitor the local weather even though this is a security risk and consumes valuable bandwidth). Users enjoy the ability to easily copy a file to floppy or burn it to CD, and the flexibility to listen to an audio CD while working at their desks. They will not give up these capabilities willingly. Users may perceive that they are being provided a lesser quality machine and have significant concerns about potential network down time. Educating and informing employees and seeking their buy-in to the process can minimize these issues.

Prior to implementation of a thin client solution each organization needs to study their automation needs and requirements. Few organizations will benefit from a straight thin client organization but rather will need to look at a mix of solutions.

Most organizations can benefit from having a thin client solution for the average user and a tubby client solution for the power user and those who travel extensively in conjunction with their position. Savings and bandwidth estimates from vendors should be taken skeptically, and organizations should establish a test base prior to full implementation of *any* hardware or software solution.

STAROFFICE

StarOffice is one of the most promising competitors to Microsoft Office. It is an office productivity package that includes word processing, spreadsheet, drawing, and presentation software that has good if not perfect compatibility with Office 97/2000. It has the ability to both read and write to Microsoft Office file formats with the exception of

Access. The remaining compatibility problems are primarily related to macros, templates, and PowerPoint animations, which translate poorly. StarOffice is an open-source program that runs on the Linux, Microsoft, and Solaris operating systems. StarOffice costs between $25 and $50 per license, depending on volume discounts. OpenOffice is a version of the program with lesser features that is available for free download. The most significant shortfalls of StarOffice are the lack of an integrated Web browser, e-mail client, and group scheduling software.[48]

StarOffice is getting businesses to re-evaluate the current practice of purchasing the same software for each system. A mixed deployment of Microsoft and StarOffice providing users the software that suits their particular needs could save an enterprise a significant amount annually. Many users in the organization never come close to exploiting the full potential of Office 97, and spending funds for upgraded functionality that is never utilized makes little or no sense. The Central Scotland Police estimate that they have saved $380,000 by adopting StarOffice on PCs running Microsoft Windows. [49] In 2001, the U.S. Defense Information Systems Agency (DISA) deployed 25,000 copies of StarOffice 5.2, which it received for no charge, on its Unix workstations.[50] The adoption of StarOffice is bound to receive an additional boost due to customer anger concerning Microsoft's implementation of Enterprise 6.0, and foreign government mandates for open-source software. The Gartner Group predicts that StarOffice has a better than 50-50 chance of taking 10% of the office productivity suite market from Microsoft by the end of 2004.[51]

The advantages of StarOffice are cost, the ability to use historic Microsoft Office formats and documents, the ability to operate in thin client or Linux and Microsoft

environments, and the ease of transition for employees who are used to Microsoft

Office. The disadvantages are compatibility with future releases of Microsoft Office and

no compatibility with Microsoft Access database.

CONCLUSION

Currently, we are locked into the Microsoft product line whose cost is increasing

significantly and leaving us extremely vulnerable due to total reliance on a single

vendor.   As we have reviewed the potentials for Microsoft, Linux, thin client, and

StarOffice, there is no single solution that will meet the overall needs of the Army in

terms of price, ease of implementation, and functionality.   Linux in its current form is

unsuitable for implementation on the desktop and will likely remain so until it has a high

level of compatibility with existing Windows applications.   ?

So what can be done to improve our infrastructure and reduce costs The military

has standardized the computer desktop and thus has purchased software licenses for

every machine regardless of what the user needs. This is very expensive and wasteful

because few users utilize all the programs on a given system. There is no reason to

pay for licenses that are never used simply to attain standardization; nor is there reason

to upgrade to a newer version of a software product unless it provides increased

security or needed features that are not available in the current version. The only

exception would be to maintain compatibility of file formats.

A well-planned and executed implementation of thin client automation will allow

the military to increase information security while reducing the required number of

support staff. Thin client devices are cheaper than desktop PCs and have a much

longer life span. Licensing costs can be reduced to cover what is actually utilized, thus generating savings that can be used to increase bandwidth and implement a more robust infrastructure so that network down time is minimized.   A reduction in power consumption is certainly an ancillary benefit of implementing thin client. End users will need to be educated and have buy-in to the solution for a successful implementation with minimal problems.

A shift in philosophy from standardization to tiered resourcing of automation will provide significant savings and efficiencies to the military.   We need to perform a thorough analysis of the automation and software requirements of users who will then be resourced according to their needs for both hardware and software.   Low to mid-level users will be provided thin client devices, while power users will be provided a tubby client solution that meets their desktop needs while providing access to thin client applications.

It is recommended that a test site be determined and StarOffice be implemented for the average user with the potential for widespread implementation based on successful test results with proven savings. A percentage of the user base will have the requirement for the full Microsoft Office productivity suite based on their job and how the product is utilized.   The Gartner Group estimates that by the end of CY 2003 more than 50% of enterprises will have an official strategy that mixes multiple versions of office automation products (by version and/or vendor).[52]

Finally, it is recommended that the improvements in the Linux operating system and other emerging technologies be continually evaluated so that maximum benefit can be obtained from limited information technology funds. Organizations should consider

training support personnel on Linux now to be prepared for future implementation of

Linux servers and/or a Linux desktop operating system.

WORDCOUNT= 6,959

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